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(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2002/0044586 A1****Myers et al.**(43) **Pub. Date: Apr. 18, 2002**(54) **VERY NARROW BAND, TWO CHAMBER,
HIGH REP RATE GAS DISCHARGE LASER
SYSTEM**

(76) **Inventors:** David W. Myers, Poway, CA (US);
Herve A. Besaucele, San Diego, CA
(US); Alexander I. Ershov, San Diego,
CA (US); William N. Partlo, Poway,
CA (US); Richard L. Sandstrom,
Encinitas, CA (US); Palash P. Das,
Vista, CA (US); Stuart L. Anderson,
San Diego, CA (US); Igor V.
Fomenkov, San Diego, CA (US);
Richard C. Ujazdowski, San Diego,
CA (US); Xiaojiang J. Pan, San Diego,
CA (US); Eckehard D. Onkels, San
Diego, CA (US); Richard M. Ness, San
Diego, CA (US); Daniel J.W. Brown,
San Diego, CA (US)

Correspondence Address:**Cymer, Inc.****Legal Department - MS/1-2A****16750 Via Del Campo Court****San Diego, CA 92127-1712 (US)**(21) **Appl. No.: 09/943,343**(22) **Filed: Aug. 29, 2001****Related U.S. Application Data**

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An injection seeded modular gas discharge laser system capable of producing high quality pulsed laser beams at pulse rates of about 4,000 Hz or greater and at pulse energies of about 5 mJ or greater. Two separate discharge chambers are provided, one of which is a part of a master oscillator producing a very narrow band seed beam which is amplified in the second discharge chamber. The chambers can be controlled separately permitting separate optimization of wavelength parameters in the master oscillator and optimization of pulse energy parameters in the amplifying chamber. A preferred embodiment in an ArF excimer laser system configured as a MOPA and specifically designed for use as a light source for integrated circuit lithography. In the preferred MOPA embodiment, each chamber comprises a single tangential fan providing sufficient gas flow to permit operation at pulse rates of 4000 Hz or greater by clearing debris from the discharge region in less time than the approximately 0.25 milliseconds between pulses. The master oscillator is equipped with a line narrowing package having a very fast tuning mirror capable of controlling centerline wavelength on a pulse-to-pulse basis at repetition rates of 4000 Hz or greater to a precision of less than 0.2 pm.

